INTERCEPTION CALL SIGNALING METHOD AND APPARATUS BETWEEN A GATEKEEPER AND AN INTELLIGENT PERIPHERAL IN A VOICE FRAME NETWORK

RELATED PATENTS

The present application is a continuation-in-part of U.S. Patent Application Serial No. 09/609,201 entitled VOICE FRAME NETWORK GATEKEEPER-TO-INTELLIGENT PERIPHERAL INTERFACE METHOD AND APPARATUS filed June 30, 2000 and subject to assignment in common herewith to Cisco Technology, Inc.

BACKGROUND OF THE INVENTION

The present invention relates generally to voice frame network gatekeepers and intelligent peripherals such as interactive voice response units (IVRs), and more particularly it concerns method and apparatus for interfacing gatekeepers to intelligent peripherals via the ITU H.323 and H.450 standards.

Previously, intelligent peripherals have been connected to gatekeepers within the Internet using proprietary interfaces. One such proprietary interface is (Bellcore) GR-1129-CORE, which can be used to connect an intelligent peripheral such as an IVR into an advanced intelligent network (AIN). The AIN includes a switch service point (SSP) with call-processing software and voice channel control and a service control point (SCP) with data-based (e.g. 800 or LNP) information required by the SSP to route a call. The intelligent peripheral is a special resource that provides additional functionality, e.g. IVR, to the SSP that may be required by the SCP. When the SSP receives a GR-1129-CORE message from the SCP containing an operation value, e.g. a '0' (play announcement), '1' (play announcement and collect digits) or '4' (flex parameter block), it passes the content to the intelligent peripheral through ISDN or Q.931. When the intelligent peripheral, e.g. an IVR, starts the specified function, it establishes a voice channel to the user through the SSP. Because the SSP controls the voice channel, it can provide such services as call transfer after the IVR transaction is finished.

Those of skill in the art will appreciate that the referenced ITU and related standards are well known, evolving standards. Accordingly, reference herein to these standards will be understood to mean the standards as they existed at the time of the earliest effective filing date of the present application, and as they have evolved to date,

and as they continue to evolve over the term of any patent that issues herefrom. Applicants note that an instructive earlier version of the ITU H.450.1 standard is described in *Generic functional protocol for the support of supplementary services in H.323*, date unknown; that the GR-1129-CORE standard is described in *AINGR: Switch--Intelligent Peripheral Interface (IPI)*, Revision 1, October, 1998 and *AINGR: Switch--Service Control Point (SCP)/Adjunct Interface*, September 1997; that the ITU-T H.225.0, ITU-T H.450.2 and ITU-T Q.931 standards are described in *Call Signaling Protocols and Media Stream Packetization for Packet Based Multimedia Communications Systems,* February 1998, *Call Transfer Supplementary Service for H.323I*, September 1997 and *ISDN User-Network Interface Layer 3 Specification for Basic Call Control*, March 1993, respectively.

No intelligent peripheral interface has been proposed heretofore that is compatible with the ITU-T H.323 or related H.225, H.245, H.450 and Q.931 standards, and the GR-1129-CORE standard.

SUMMARY OF THE INVENTION

The invention involves telecommunications apparatus between a voice frame network gatekeeper and intelligent peripheral. One such exemplary intelligent peripheral is the interactive voice response unit (IVR) described and illustrated herein. Other intelligent peripherals may use the invented interface, however, within the spirit and scope of the invention.

Telecommunications apparatus between a voice frame network gatekeeper and an intelligent peripheral, e.g. an interactive voice response unit (IVR), includes a voice frame network connection for coupling the same. The apparatus also includes a protocol over the connection that provides supplemental service messaging therebetween, the protocol enabling the gatekeeper to selectively insert one or more messages to the intelligent peripheral and to selectively intercept one or more messages therefrom. Preferably such insertion is of one or more GR-1129-CORE send-to-resource (STR) messages and such interception is of one or more ITU-T H.323 FACILITY messages including a RETURN RESULTS component. An invocation mechanism within the gatekeeper and a performance mechanism within the IVR permits the gatekeeper to set a defined task to the IVR, also preferably in accordance with the ITU-T H.323 and H.450 standards.

The method involves configuring the gatekeeper as a supplemental services provider (SSP) and configuring the IVR as an intelligent peripheral, under ITU-T H.450. The method further involves conveying requests from the gatekeeper to the IVR and conveying responses thereto from the IVR to the gatekeeper, wherein the gatekeeper selectively intercepts one or more messages from the IVR and, optionally, also selectively inserts one more messages to the IVR.

The foregoing and other objects, features and advantages of the invention will become more readily apparent from the following detailed description of a preferred embodiment that proceeds with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a system block diagram illustrating a voice frame network with a gatekeeper and an intelligent peripheral interfaced in accordance with a preferred embodiment of the invention.

Fig. 2 is a schematic block diagram of the H.323 gatekeeper, intelligent peripheral and gateway architecture in accordance with a preferred embodiment of the invention.

Fig. 3 is a more detailed schematic diagram of the gatekeeper-to-intelligent peripheral interface in accordance with a preferred embodiment of the invention.

Fig. 4 is a flowchart illustrating the interface method in accordance with a preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 is a system block diagram of a network 10, i.e. the Internet, with a voice frame network, e.g. an H.323 network, 12 forming a part thereof. A gatekeeper 14 and one or more intelligent peripherals, e.g. interactive voice response units (IVRs), 16a, 16b may be seen to represent two or more nodes within voice frame network 12. Those of skill in the art will appreciate that typically there may be many such voice frame networks such as voice frame network 12 connected to the Internet. Those of skill in the art also will appreciate that typically there may be many such connected gatekeepers and intelligent peripherals such as gatekeeper 14 and IVR 16a.

A public switched telephone network (PSTN) 18 may connect voice traffic from one or more telephones 20 to H.323 network 12 via one or more H.323 gateways (GWs)

22a, 22b, 22c. A customer database 24 is connected to H.323 network 12 to provide needed preferences such as scripts, announcements or other recordings for play out, as will be described. Internet protocol (IP) phones 26 or other H.323 devices may also be connected to H.323 network 12, as shown.

The invented gatekeeper-to-intelligent peripheral interface is indicated generally at 28. Interface 28 will be understood to be implemented preferably in software or firmware, but it may be implemented, within the spirit and scope of the invention, in hardware. Interface 28 will be understood to span and interconnect--as well as define the behavioral relationship between--gatekeeper 14 and intelligent peripheral 16. Interface 28 accordingly may be implemented as compatible and communicative software modules residing in gatekeeper 14 and IVR 16a, preferably integrated with the software that controls the conventional functions of the gatekeeper and the intelligent peripheral.

Fig. 2 shows H.323 GW 22a terminating the public switched telephone network (PSTN) signaling channel and voice channel and originating H.323 signaling channels 12a, 12b and an RTP/RTCP (voice) stream. Because H.323 gatekeeper 14 does not directly control the voice channel, it is provided with auxiliary means to obtain indirect control of the voice channel via interface 28 to IVR 16a. Importantly, such auxiliary means are compatible with the existing GR-1129-CORE-based standards, and, by extension thereof but without modification, the interface provides for the needed call transfer and other features under the International H.323/H.225./H.245/H.450 standards. Accordingly, the invented H.323 gatekeeper-intelligent peripheral interface 28 provides full and extensible functionality and compatibility with old and new standards and protocols.

Also shown in Fig. 2 is a conventional SCP 15 with associated data storage device, e.g. disc drive, 15a. Those of skill in the art will appreciate that in accordance with the invention, gatekeeper 14 is capable of selective interception and insertion or removal of messages and content between the gatekeeper and the intelligent peripheral, as will be explained in detail below. Importantly, such selective interception and insertion or removal of messages and content permits much greater flexibility in messaging between a calling party and a called party, yet without any required modification to the installed base of SCPs and associated data storage devices.

Fig. 3 shows interface apparatus 28 in the form of a more detailed schematic

diagram. Gatekeeper 14 may be seen to be interfaced to IVR 16a via interface 28 by inclusion preferably of memory-resident software instructions executed by a processor that forms a part of the gatekeeper and intelligent peripheral. In other words, additional code may readily be installed in the existing base of gatekeepers and intelligent peripherals to render them compatible with the International H.323 standard. The invented apparatus in a preferred embodiment of the invention thus preferably includes a voice frame network connection 12c for coupling gatekeeper 14 to IVR 16a. It further includes protocols (RAS, H.225 + H.450.1 + GR-1129-CORE) over the connection that provides supplemental services messaging between the gatekeeper and the intelligent peripheral, the protocol conveying a REQUEST from the gatekeeper to the intelligent peripheral and a RESPONSE from the intelligent peripheral to the gatekeeper. Finally, it includes a command structure (to be described below) embedded in such request/response protocol, the command structure including a call-transfer request/response sequence to which the gatekeeper is responsive.

Interface apparatus 28 in another preferred form may be thought of as coordinating a voice frame network gatekeeper and an intelligent peripheral. Preferably, in this form, interface apparatus 28 includes an invocation mechanism 30 within gatekeeper 14 for setting a defined task to IVR 16a via in-band signaling. Interface apparatus 28 further includes a performance mechanism 32 within the intelligent peripheral responsive to the invocation mechanism for performing the defined task. Importantly, the invocation mechanism and the performance mechanism comply with International H.323, H.225 and H.450.x standards (where x indicates successive versions).

Fig. 4 illustrates the invented gatekeeper-to-intelligent peripheral interfacing method preferably is implemented in accordance with the invention. At 100, gatekeeper 14 is configured as a supplemental services provider (SSP) under the H.323 and H.450.x standards. At 102, IVR 16a is configured as an Intelligent Peripheral under the same standard.

At 104, requests are conveyed from gatekeeper 14 to IVR 16a over voice frame network 12 in accordance with a defined protocol, e.g. the protocol described above or a suitable alternative. Those of skill in the art will appreciate that, in accordance with the present invention, gatekeeper 14 selectively inserts a message, e.g. an STR message, to the intelligent peripheral, e.g. IVR 16a. Gatekeeper 14 also may, in accordance with the

spirit and scope of the invention, selectively remove a message, e.g. a reject (REJECT) component of a release complete (RELEASE COMPLETE) message, from the message stream to the intelligent peripheral, e.g. IVR 16a.

At 106, responses to the requests are conveyed from IVR 16a to gatekeeper 14 and are received by gatekeeper 14 over voice frame network 12 in accordance also with a defined protocol, as described and illustrated herein. For example, IVR 16a may return any of the standard operation return result, return error or reject transaction responses under International standard H.450.x. Those of skill in the art will appreciate that, in accordance with the present invention, gatekeeper 14 selectively intercepts a message, e.g. a FACILITY message containing a RETURN RESULTS component, from the intelligent peripheral, e.g. IVR 16a. Such selective message interception may be referred to herein as selective message termination by the gatekeeper.

Those of skill in the art will appreciate that Bellcore GR-1129-CORE for AIN 0.1 provides an interface between an AIN SSP and an AIN intelligent peripheral. It has following three characteristic types of information exchange on an ISDN interface between SSP and an intelligent peripheral: 1) The SCP requiring the intelligent peripheral to exchange information with a user, in which the SSP forwards data from the SCP to an intelligent peripheral and sets up an in-band connection between the user and the intelligent peripheral; 2) The SSP supporting ISDN BRI and PRI between an intelligent peripheral and an SSP for signaling and transport for call originations and call terminations; 3) The SSP providing protocol inter-working from an intelligent peripheral on ISDN BRI and PRI to a SCP for non-call associated signaling.

The interface between the GK and the H.323 intelligent peripheral uses the H.450.1 APDU in the H.225.0 call signaling messages and follows the GR-1129-CORE signaling scheme originally for interface between the SSP and an ISDN-connected intelligent peripheral. The high level architecture of this interface is showed in Fig. 2. The GK can be considered an SSP that provides specified SCP services and the H.323 IVR can be considered an intelligent peripheral. Importantly, in accordance with the present invention, GK is programmed selectively to insert messages, e.g. one or more send-to-resource (STR) messages, to the intelligent peripheral, e.g. IVR 16a. Also importantly, GK is programmed further selectively to intercept messages, e.g. one or more facility (FACILITY) messages, from the intelligent peripheral, e.g. IVR 16a, wherein typically the intercepted FACILITY message contains a return results

(RETURN RESULTS) component.

TABLE 1 below summarizes the GR-1129-CORE defined signaling supported by an SSP used for the GK in accordance with invention.

TABLE 1

SSP supported signaling providing for	SSP supported signaling used by GK
Setting up a connection between a user and an intelligent peripheral, and passing information between a service on SCP and the intelligent peripheral related to that connection	A trigger is encountered by the GK, and related service is invoked to process the call. The service can be resident on the GK or on a SCP. The service requires GK to setup a connection between user and the H.323 intelligent peripheral to exchange information between them related to the call
Passing non-call associated data between the service on SCP and an ISDN-connected device	Passing non-call associated data, such as authentication information, password or Personal Identification Number (PIN), etc., between the service on GK or SCP and the H.323 intelligent peripheral
Allowing call origination and call termination over the intelligent peripheral	Allowing call terminating at the H.323 intelligent peripheral, such as playing an announcement before release the call and the H.323 intelligent peripheral reports the result to GK

In order to use GR-1129 for interface between GK and the H.323 intelligent peripheral, the GR-1129-CORE message Send_To_Resource (STR) can be generated by any services that request the intelligent peripheral resource, either AIN services on SCP or H.323 services on GK. The operation of the STR message is contained in an H.450 Application Protocol Data Unit (APDU) carried in the H.225.0 FACILITY or SETUP message and response is returned in a non-standard data carried in the H.225.0 FACILITY or RELease COMplete message. Other H.225.0 call signaling messages are not allowed to carry a STR operation.

The above-referenced protocol and command structure now will be described. Preferably, conveying step 104 includes invoking a call-transfer request/response sequence to which the intelligent peripheral is responsive to route a given call to a different telephone line (extended value '100'), the number of which is provided in conjunction with the call-transfer request/response sequence (via flex-parameter-block and/or database 24). More preferably, conveying step 104 further includes invoking play-recorded-audio (value '0') and play-recorded-audio-and-await-digital-input (value

'1') sequences to which IVR 16a is responsive. Most preferably, conveying step 104 further includes invoking flex-parameter-block (value '4'), play-recorded-audio-and-terminate-call (extended value '101') and play-recorded-audio-using-specified-script (extended value '102') sequences to which IVR 16a is responsive. Those of skill in the art will appreciate that, in accordance with the invention, the protocol and embedded command are realized by in-band signaling, between the gatekeeper and the intelligent peripheral, i.e. signaling or messaging across network connection 12c.

TABLES 2 through 5 immediately below summarize STR signaling between GK 14 and IVR 16a, in accordance with the invention by the use of H.450.1 APDU, which is compatible nevertheless compatible with both ITU H.323 and GR-1129-CORE. TABLES 2-5 are believed to be self-explanatory to those of ordinary skill in the art.

TABLE 2: GK USES FACILITY MESSAGE WHEN A SUBSEQUENCE COMPONENT IS SENT TO H.323 IVR FOR ACTIVE STR-CONNECTION

Information Element	Value	Inclusion Condition
Protocol discriminator	Q.931	Mandatory
Call reference (CR)	CR value = value in SETUP message	Mandatory
Message type	FACILITY	Mandatory
User-to-User		Mandatory
H.450.1 APDU	Invoke component (See Section 5.2.3 of GR-2823-CORE.)	Mandatory for IVR interface

Direction: GK → IVR

TABLE 3: H.323 IVR USES FACILITY MESSAGE FOR SUBSEQUENCE RESULT EXCHANGE WITH GK FOR ACTIVE STR-CONNECTION

Information Element	Value	Inclusion Condition
Protocol discriminator	Q.931	Mandatory
Call reference (CR)	CR value = value in SETUP message	Mandatory
Message type	FACILITY	Mandatory
User-to-User		Mandatory
H.450.1 APDU	Return Result, Return Error, or Reject component (See Section 5.2.3 of GR-2823-CORE.)	Mandatory for IVR interface

Direction: IVR → GK

TABLE 4. H.323 IVR USES RELEASE COMPLETE MESSAGE TO INDICATE IT HAS RELEASED BOTH BEARER AND SIGNALING CHANNELS AND CALL REFERENCE

Information Element	Value	Inclusion Condition
Protocol discriminator	Q.931	Mandatory
Call reference	CR value = value in SETUP message	Mandatory
Message type	RELease COMplete	Mandatory
Cause (defined in Q.931)	16 = normal clearing (currently not used) 21 = call rejected 65 = bearer capability not implemented	Mandatory
User-to-User		Mandatory
H.450.1 APDU	Return Result, Return Error, or Reject component (See Section 5.2.3 of GR-2823-CORE.)	Mandatory for IVR interface

Direction: IVR → GK

TABLE 5: GK USES SETUP MESSAGE TO ESTABLISH STR-CONNECTION TO H.323 IVR AND REQUEST "sendToResource" OPERATION

Information Element	Value	Inclusion Condition
Protocol discriminator	Q.931	Mandatory
Call reference (CR)	any valid value not in use	Mandatory
Message type	SETUP	Mandatory
Bearer capability	See Section 7.3.10 of H.225.0	Mandatory
User-to-User		Mandatory
H.450.1 APDU	Invoke component (See Section 5.2.3 of GR-2823-CORE.)	Mandatory for IVR interface
Other information elements (Calling party number, Called party number, etc.) as defined in Table 11 of H.225.0	As defined in H.225.0	As required in H.225.0 for Calling Party Number if subscribed to by the IVR

Direction: GK → IVR

Setup and clearing of the connection between the GK and the H.323 intelligent peripheral in accordance with the invention will now briefly be described.

If the SETUP message is not acceptable (e.g., the protocol errors and invalid Invoke component), the H.323 intelligent peripheral responds with a RELease COMplete message that contains a Return Result, Return Error, or Reject component.

A preferred method of clearing a GK initiated STR-connection is to have the GK send a "cancelResource" operation in a FACILITY message to the H.323 intelligent peripheral when the GK receives a Cancel_Resource_Event message from the SCP, when the calling user hangs up while the STR-connection is active, or when the GK

application decides to terminate the IVR service due to some error condition. The GK expects the H.323 intelligent peripheral to send a RELease COMplete message when the H.323 intelligent peripheral receives the "cancelResource" operation in a FACILITY message.

The invoker (GK) uses the return result component described below in TABLE 6 to request an operation from the performer (intelligent peripheral, e.g. IVR).

TABLE 6: INVOKE COMPONENT

Data Element	Value	Inclusion Condition
Component type	Invoke as defined in Section 5.4.1 of GR-2823-CORE for Primary Rate Interface (PRI)	Mandatory
Invoke Identifier	Invoke identifier value = any value not in use. Invoke identifier is defined in Section 5.4.2 of GR-2823-CORE for PRI	Mandatory
Operation value	Use Operation value tag and length for object identifier as defined in Section 5.4.5 of GR-2823-CORE for PRI.	Mandatory
Argument(s)	The possible arguments for "sendToResource" operation are: Resource Type, strParameterBlock and DisplayText. There is no argument for "cancelResource" operation.	Conditional

Direction: GK → IVR

The IVR uses the return result component described below in TABLE 7 to return results and to indicate that the operation was performed successfully.

TABLE 7: RETURN RESULT COMPONENT

Data element	Value	Inclusion Condition
Component type	Return Result as defined in Section 5.4.1 of GR-2823-CORE for PRI.	Mandatory
Invoke Identifier	Invoke identifier value = value in Invoke component for this component exchange.	Mandatory
Sequence	Sequence is defined in Section 5.4.6 of GR-2823-CORE for PRI.	Conditional (included if any results are returned)
Operation value	Use Operation value tag and length for object identifier as defined in Section 5.4.5 of GR-2823-CORE for PRI.	Conditional (included if any results are returned)
Results	The possible results for "sendToResource" operation are: ReturnBlock	Conditional

Direction: IVR → GK

The GK and the intelligent peripheral use the return error component described

below in TABLE 8 to indicate the requested operation was performed unsuccessfully. For example, the GK uses it to signal the intelligent peripheral that an error was discovered in its return component, and the intelligent peripheral uses it to signal the GK that an error was discovered in the invoke component.

TABLE 8: RETURN ERROR COMPONENT

Data Element	Value	Inclusion Condition
Component type	Return Error as defined in Section 5.4.1 of GR-2823-CORE for PRI.	Mandatory
Invoke Identifier	Invoke identifier value = value in Invoke component for this component exchange	Mandatory
Error value	Use Error value tag and length as defined in Section 5.4.7 of GR-2823-CORE for PRI.	Mandatory
Parameter(s)	Figures 4-3 of GRI-1129-CORE defines Error-parameter returned for "sendToResource" operation	Conditional

Direction: IVR ↔ GK

The GK and intelligent peripheral use the reject component described below in TABLE 9 to indicate that a received operation component was rejected.

TABLE 9: REJECT COMPONENT

Data Element	Value	Inclusion Condition
Component type	Reject as defined in Section 5.4.1 of GR-2823-CORE for PRI	Mandatory
Invoke Identifier	Invoke identifier value = value in Invoke component for this component exchange	Mandatory
Problem value	Use Reason for component rejection as defined in Section 5.4.8 or Figure 5-3 in Section 5.5.1 or GR-2823-CORE for PRI.	Mandatory

Direction: IVR↔ GK

The signaling procedures for the interface between the GK and the intelligent peripheral will be appreciated by those of skill in the art to be based on GR-1129-CORE procedures for an SSP communicating with an intelligent peripheral. The model used for signaling procedures is a request/reply exchange. Briefly summarizing, the invoker (GK) requests a service from the performer (intelligent peripheral, e.g. IVR). It expects that the performer respond either with success or failure to the request from the invoker.

A component consists of a request to performer as an operation. An operation is an action to be performed by the remote end. A component can also consist of a report of success or failure due to execution of the operation by the remote end. In accordance

with a preferred embodiment of the invention, four components are used to request and respond to an operation between the GK and the intelligent peripheral. An operation is defined by its operation value and the arguments associated with the operation.

The four components tabulated above in TABLES 6 through 9 will be described in more detail below.

The GK will use an invoke component to begin a new component exchange with the intelligent peripheral. In accordance with invented interface 28, the intelligent peripheral will not initiate a new component exchange with the GK. The invoke component contains a parameter to identify an operation and the arguments needed by the performer to perform the requested operation.

If the requested operation is performed successfully, the intelligent peripheral will send a return result component in response to the invoke component from the GK (the invoker). The return result component may contain some parameters to be returned to the invoker.

The intelligent peripheral will send a return error component to the GK in response to the invoke component if the requested operation cannot be performed. The return error component contains a specific error cause for each situation that indicates the reason for failure. Those of skill in the art will appreciate that, within the spirit and scope of the invention, it may contain other or additional parameters.

A Reject component will be sent by the intelligent peripheral to reject a received Invoke component. The components may be rejected for such reasons as protocol violations or unrecognized components or parameters. The reject component preferably contains a parameter that indicates the reason for rejection.

The interface 28 command structure is briefly summarized below in TABLE 10.

TABLE 10: REQUIRED ELEMENTS FOR RESOURCE TYPE

ResourceType	StrParameterBlock	Rerouting Number	Comments
0: PlayAnnouncement	AnnouncementBlock	N/A	
1: PlayAnnouncement and Collect Digits	AnnouncementDigit Block	N/A	
100: Perform CT	N/A	AlianAddress	Intelligent peripheral will execute the H.450.2 CT to the endpoint specified by the ReroutingNumber
101: Play Announcement and Terminate the Call	AnnouncementBlock	N/A	Intelligent peripheral terminates the call after announcement is played
102: Play Announcement with Specified Script	FlexParameterBlock (in which the name of the script is given)	N/A	The script is executed by the H.323 intelligent peripheral

The GK sends an invoke component that contains an operation "sendToResource" in a SETUP message to the intelligent peripheral. The intelligent peripheral responds with appropriate H.225.0 call signaling messages, such as CALL PROCeeding, ALTERing, or CONNect, and accepts the STR-connection. The intelligent peripheral either sends a return result component (contained in H.450.1 APDU of the RELease COMplete message) if the operation is performed successfully, or a return error component (contained in the non-standard data of the RELease COMplete message) if the operation cannot be performed. In accordance with a preferred embodiment of the invention, the intelligent peripheral does not clear the STR-connection when it has taken the final action on the requested operation.

If the intelligent peripheral is unable to process the "sendToResource" operation contained in the SETUP message, it takes one of the following actions:

The intelligent peripheral clears the STR-connection and rejects the SETUP message by sending a RELease COMplete message contains a reject component. The intelligent peripheral may reject for such reasons as protocol violations or unrecognized components. Preferably, the reject component contains a parameter that indicates the reason for rejection.

Preferably, the intelligent peripheral accepts the STR-connection and then sends a FACILITY message if it does not recognize the "sendToResource" operation. The intelligent peripheral rejects for such reasons as unrecognized operations. The reject

component preferably contains a parameter that indicates the reason for rejection.

For a STR-connection in the active state, the FACILITY message is also used for the exchange of components over the existing signaling connection. This signaling connection is identified by the call reference value of the corresponding STR-connection. If an STR-connection associated FACILITY message is sent by using a call reference value of an active STR-connection, and this STR-connection is cleared due to STR-connection related causes, then the GK or the intelligent peripheral sends a response within H.450.1 APDU in the first clearing message, i.e., the RELease COMplete message.

The GK sends a SETUP message to the intelligent peripheral when the GK requires intelligent peripheral service or the GK application receives a STR message from the SCP. The following script illustrates a valid STR-connection establishment message sequence to the H.323 intelligent peripheral.

H.225.0 Call Signaling With GR-1129-Core Extension Script

Setup (GK → IVR)

Timeout T303

Setup (GK → IVR)

Call

Proceeding (IVR → GK)

Altering (IVR → GK)

Connect (IVR → GK)

Connect Ack (GK → IVR)

It will be appreciated that if the H.323 intelligent peripheral does not respond within a predefined time limit, e.g. within timeout T303, then a second SETUP message is sent. The only valid response messages sent by the H.323 intelligent peripheral to an incoming SETUP message are:

CALL PROCeeding – CONNect;

CALL PROCeeding – ALTERing – CONNect;

ALTERing – CONNect; or

CONNect.

A preferred method of clearing an H.323 intelligent peripheral initiated STR-connection is to have the H.323 intelligent peripheral send a RELease COMplete message in response to a SETUP message.

Such a flex-parameter-block sequence invokes in IVR 16a a defined, but variable response, typically as may be determined by individual manufacturers of the intelligent peripheral or gatekeeper. For example, in a preferred embodiment of the invention, the flex-parameter-block sequence may contain a script file name that the intelligent peripheral has pre-loaded. When extended value '102' is conveyed from the gatekeeper to the intelligent peripheral, the command may be to play-announcement-using-script-name-specified-in-flex-parameter-block. The flex-parameter-block may contain the parameter script-file-2. In response, the intelligent peripheral would load the specified script file, e.g. from database 24, and play it out rather than a default announcement. Those of skill in the art will appreciate that the three existing defined GR-1129-CORE values, as well as the invented H.323 values and the respective features represented thereby are further extensible as the H.323 intelligent peripheral services evolve in accordance with the present invention. Any and all such overall features are contemplated, and are within the spirit and scope of the invention.

Those of skill in the art will appreciate that the values and their functions described herein are illustrative only and that the invention is not so limited. Any suitable set of functions assigned to any suitable set of values is contemplated, and is within the spirit and scope of the invention. Those of skill in the art also will appreciate that the added functionality of the gatekeeper and intelligent peripheral made possible by provision of the invented interface therebetween is transparent to other voice frame network devices. This ensures its broad compatibility in network design with the installed base of intelligent peripheral (e.g. IVR), AIN, GR-1129-CORE and H.323 equipment.

Finally, those of skill in the art will appreciate that the invented method and apparatus described and illustrated herein may be implemented in software, firmware or hardware, or any suitable combination thereof. Preferably, the method and apparatus are implemented in software, for purposes of low cost and flexibility. Thus, those of skill in the art will appreciate that the method and apparatus of the invention may be implemented by a computer or microprocessor process in which instructions are executed, the instructions being stored for execution on a computer-readable medium and being executed by any suitable instruction processor. Alternative embodiments are contemplated, however, and are within the spirit and scope of the invention.

Having illustrated and described the principles of my invention in a preferred embodiment thereof, it should be readily apparent to those skilled in the art that the invention can be modified in arrangement and detail without departing from such principles. We claim all modifications coming within the spirit and scope of the accompanying claims.